

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)	
)	
Report on the Feasibility of Allowing)	
Commercial Wireless Services, Licensed or)	GN Docket No. 18-122
Unlicensed, to Use or Share the Frequencies)	
Between 3.7-4.2 GHz)	

COMMENTS OF RAYTHEON COMPANY

Raytheon Company ("Raytheon"), by its attorney, hereby submits these reply comments with regard to the Public Notice in the above-captioned docket seeking comment to assist the Commission in the preparation of a report to Congress and the Secretary of Commerce on the opportunities for commercial mobile wireless services to gain access to the 3.7-4.2 GHz band (the "4 GHz Band").¹ As the comments of others make clear, there are a large number of registered and currently unregistered receive-only satellite earth stations in the 4 GHz Band reflecting the importance of this spectrum for a number of mission critical and other services, including audio and video content distribution. The Commission should proceed with caution in considering other regulatory frameworks for this band, ensuring that the applications supported by these earth stations are adequately protected.

Raytheon is a technology and innovation leader specializing in defense, civil government and cybersecurity solutions. Founded in 1922 and headquartered in Waltham, Massachusetts,

¹ Public Notice, *Office of Engineering and Technology, International, and Wireless Telecommunications Bureau Seek Comment for Report on the Feasibility of Allowing Commercial Wireless Services, Licensed or Unlicensed, to Use or Share Use of the Frequencies Between 3.7-4.2 GHz*, GN Dkt. No. 18-122, DA 18-446 (May 1, 2018) ("Notice"). The report is required by Section 605(b) of the Consolidated Appropriations Act, 2018, P.L. 115-141, Division P, the Repack Airwaves Yielding Better Access for Users of Modern Services (RAY BAUM'S) Act.

Raytheon provides state-of-the-art electronics, mission systems integration, C5I™ products and services, sensing, effects and mission support services. Of particular relevance to the instant proceeding, and the reason for these reply comments, Raytheon supports more than a hundred forty (140) receive-only earth stations that feed Advanced Weather Interactive Processing System (“AWIPS”) workstations used by the federal government to support downlink of weather-related data which is used in real-time and near-real-time for operational purposes.² These existing earth stations, currently unregistered, as permitted under the Commission’s Rules, are in the process of being registered pursuant to the 90-day registration window recently created by the Commission.³

The weather data that is downlinked in the 4 GHz band to these and other earth station locations constitute a broad range of critical information that is relied upon regularly indirectly, if not directly, by virtually all citizens, businesses, governments, and institutions throughout the country. The NOAAPort broadcast system operating in the 4 GHz Band by a commercial satellite provider delivers one-way broadcast communication of NOAA meteorological and

² The 142 earth stations serve National Oceanographic and Atmospheric Administration (“NOAA”) offices in all fifty states, Puerto Rico, and via terrestrial connection to one of the receive stations, Guam, as well as Naval Fleet Weather Centers and the Joint Typhoon Weather Center serving mission critical Government and Military operations. Raytheon also supports NOAA, other federal agencies, and numerous other organizations with a need for weather data and products in a number of other ways, building on broad experience in providing environmental solutions ranging from sensor development; space systems payloads; command, control and communications systems; space mission data processing; space systems operations and maintenance; and information dissemination, including broadcasts and warnings. For example, Raytheon not only developed and is operating the ground segment for the United States’ next generation polar-orbiting meteorological and environmental satellites – namely the Joint Polar Satellite System (“JPSS”) – the first satellite of which launched last November and is in the process of replacing the Polar Orbiting Environmental Satellite (“POES”) System – but also built the primary meteorological sensor on JPSS, the Visible Infrared Imaging Radiometer Suite (“VIIRS”).

³ See Public Notice, *Temporary Freeze on Applications for New or Modified Fixed Satellite Service Earth Stations and Fixed Microwave Stations in the 3.7-4.2 GHz Band, 90-Day Window to File Applications for Earth Stations Currently Operating in 3.7-4.2 GHz Band*, GN Docket Nos. 17-183, 18-122, DA 18-398 (Apr. 19, 2018) (“April 19 Public Notice”).

environmental data and information to fixed earth station locations in near-real time to NOAA and external users.⁴ The system provides operational and mission critical forecasts, warnings and other products to the mass media (newspapers, radio stations, TV, etc.), emergency management agencies, and private weather services as well as internal communications within the National Weather Service.⁵ Underscoring the time-critical nature of some operational uses, some immediate warnings for phenomena such as tornados and other severe weather events have delivery requirements measured in seconds and depend upon the data being delivered via satellite broadcast. Interruptions to reliable weather data needed by AWIPS to support these warnings can have direct and potentially dire impacts to lives, property, and commerce.

Raytheon supports the joint comments of American Meteorological Society (“AMS”), American Geophysical Union (“AGU”), and the National Weather Association (“NWA”) (collectively, the “Joint Weather Commenters”) which underscore the importance of protecting receive-only earth stations in the 4 GHz Band used for weather-related applications.⁶ As the Joint Weather Commenters explain, the types of information delivered over NOAAPort on an unencrypted basis and is available to the public to downlink include forecast and warning bulletins, surface and upper-air observations from airport instruments and weather balloons (*i.e.*, radiosondes), radar data, satellite imagery, numerical weather prediction output.

The Joint Weather Commenters express a strong concern about the adequacy of any potential alternative delivery methods that might replace the role that 4 GHz Band downlinks

⁴ See <http://www.nws.noaa.gov/om/marine/noaaport.htm>

⁵ There are tens of thousands of products in the 4 GHz Band satellite broadcast. These make up approximately 84 Gigabytes of essential weather data delivered every day which include the critical watches, warnings, and advisories issued by forecasters.

⁶ See Comments of the Joint Commenters, GN Docket No. 18-122 (filed May 31, 2018) (“AMS/AGU/NWA Comments”).

play today. They note, for example, that they are “unconvinced that terrestrial Internet-only delivery mechanisms are suitable for critical weather information.”⁷ Raytheon wishes to emphasize that the interference with, or worse yet, the outright loss of this mission critical data that relies today on access to 4 GHz Band would generate immediate adverse impact, including during dangerous weather events. If other delivery system are to be considered, there should be no doubts about their efficacy to deliver data comparable to what 4 GHz band earth station operators enjoy today.

Further, any potential work around is not likely to be as reliable as has been possible in the 4 GHz band which allows high throughput – Raytheon emphasizes that the earth stations it supports receive data from the commercial satellite provider at 75 Mbps speeds – with minimal atmospheric attenuation. Any revised regulatory framework that impacts the current use of the 4 GHz Band, whether spectrum- or terrestrial-based, must ensure there is no degradation in the high reliability and capacity that exists today. Higher frequency bands – such as the Ku band – are more susceptible to atmospheric attenuation and is not a suitable substitute for the C-band, as other commenters in the record have noted. Further, Internet-based and other terrestrial solutions typically include multiple points of failure relative to bent satellite links and face numerous other challenges, including the availability of and maintenance of suitable fiber, as well as throughout capacity, especially to locations in remote areas. Today, a number of the more than one hundred earth stations that Raytheon supports are in less accessible areas (e.g., Alaska) where Internet

⁷ *AMS/AGU/NWA Comments* at 3. The Joint Weather Commenters allow that “redundancy [from terrestrial delivery systems] could ameliorate the most substantial impacts in the event of interference from new commercial wireless users operating in or adjacent to the 4040 MHz NOAA Port band.” *Id.* While this may be true, Raytheon would reiterate that the best course is, through a rigorous set of band sharing or coordination principles, supported by analysis and field tests as necessary, to reduce or eliminate the potential for interference from commercial wireless users if the Commission introduces new types of users into the band.

connectivity and other terrestrial communications are limited and subject to potential disruption due to weather or other natural or man-made phenomena. Similarly, if there are outages, restoration would be beset with many difficulties. Consequently, satellite is the most, and sometimes only reliable means for distribution of this essential data, allowing watches and warnings to continue flowing to constituents, first responders, and recovery personnel, even if the terrestrial connection is broken as occurred during and after Hurricanes Katrina and Maria, when forecast office operations were maintained through satellite connections.

Moreover, the numerous 4 GHz receive-only earth stations in use today represent a substantial sunk investment. Any changes imposed on the users of the receive-only earth stations would involve significant effort and impose substantial costs on Raytheon's customers, which includes NOAA and other federal agencies, as well as on other earth-station operators. As the Joint Weather Commenters highlight, these operators include academic, industry, and public members of the weather and emergency management communities do not traditionally follow FCC proceedings.⁸ Many have limited budgets and resources.

As a final matter, the Joint Weather Commenters contend that it "would be prudent for the FCC to extend the registration window for existing receive-only NOAAPort antennas."⁹ Currently, under the *April 19 Public Notice*, the Commission has given unregistered 4 GHz Band earth station operators through July 18, 2018, to register their earth stations.¹⁰ While Raytheon is working diligently to see that the earth stations it supports are registered by that deadline, and is currently optimistic about reaching that target, it agrees with the Joint Weather Commenters that the registration process is burdensome and time consuming, especially for

⁸ *AMS/AGU/NWA Comments* at 3.

⁹ *Id.*

¹⁰ *April 19 Public Notice*.

those not familiar with the process and Commission proceedings.¹¹ It is important that the Commission and other parties interested in the 4 GHz band have as full a picture as possible how the band is being utilized. Without the information registration of the 4 GHz band receive-only earth stations would provide, it will not be possible to answer the questions the Commission poses in the *Notice*. If a reasonable extension is needed to ensure the information is available regarding earth stations in the 4 GHz band, the Commission should provide that relief.

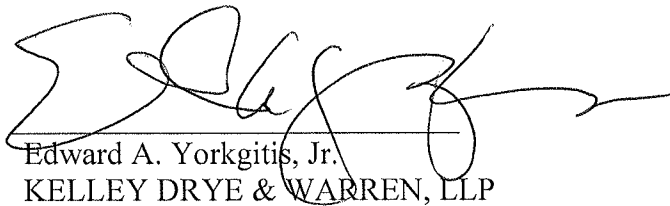
In conclusion, before making any changes in the regulatory framework concerning the 4 GHz Band, the Commission should take full account of the impacts on the operations of receive-only earth stations, including the large number throughout the United States supporting critical weather-related functions on which all sectors of the American public rely. The information about current earth station use in the band that will result from registrations is critical to that end. If prospective users wish to access the band, the burden should be on them to propose economic

¹¹ See *AMS/AGU/NWA Comments* at 3. See also letter of Susan H. Crandall, Associate General Counsel, Intelsat Corporation, and Petra Vorwig, Senior Legal & Regulatory Counsel, SES Americom, Inc. to Marlene H. Dortch, GN Docket Nos. 17-183 and 18-122 (filed May 29, 2018)(discussing the burdens of registration for smaller earth station operators).

and technically feasible ways in which comparable connectivity can be provided, including the means by which existing earth station operators from the federal government and commercial enterprise weather communities can support any modifications that would be required to their operations.

Respectfully submitted,

RAYTHEON COMPANY

A handwritten signature in black ink, appearing to read 'E. Yorkgitis, Jr.', is written over a horizontal line.

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